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CADET EVALUATION BATTERY: A COMPARISON OF 1975 MALE AND FEMALE SCORES WITH ONE ANOTHER AND WITH 1971 MALE SCORES

E. Sue Mohr and Michael G. Rumsey

PERSONNEL ACCESSION AND UTILIZATION TECHNICAL AREA

U. S. Army
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The present study compared male and female performance on the Cadet Evaluation Battery (CEB), a measure of Army officer potential, and compared male scores achieved in two testing periods 4 years apart. The CEB was administered to 637 male cadets in the 2d year (Military Science II) of the Army Reserve Officers' Training Corps (ROTC) in 1971 and to 1,035 female and 926 male applicants in the 3d year of ROTC (MS III) in 1975. Cognitive scale scores from the 1971 sample were superior to the cognitive scores

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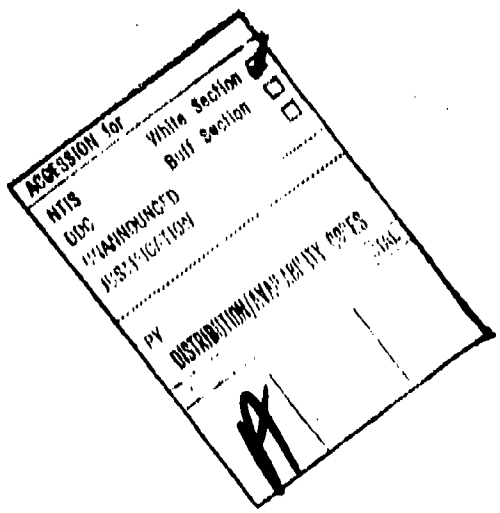
for both the male and female 1975 samples, while the noncognitive scores for the 1975 male group exceeded those for the 1971 group on three of four scales. These results were discussed in terms of changes in the nature of the ROTC population following the cessation of the draft. Comparisons between male and female scores from the 1975 samples indicated that females tended to perform as competently as males on the cognitive scales but revealed that male performance was superior on all four noncognitive scales. Discussion of the sex differences observed focused on the use of all-male samples in the development of the CEB.



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CADET EVALUATION BATTERY: A COMPARISON OF 1975 MALE AND FEMALE SCORES WITH ONE ANOTHER AND WITH 1971 MALE SCORES

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FOREWORD

The Personnel Accession and Utilization Technical Area of the Army Research Institute for the Behavioral and Social Sciences (ARI) is concerned with providing integrated sets of techniques to support Army personnel management systems. Early identification of officer leaders and development of officer leadership from cadet training through company and field grade assignments are of major concern in the management of the Army's manpower resources. ARI conducts research to provide scientific means of identifying individuals with good leadership potential for officer training, selecting officers for commissioning, and evaluating their performance.

The Cadet Evaluation Battery (CEB) was developed as an end product of a program undertaken to meet the need for improving the selection and assignment of personnel in accord with their capabilities to meet differing leadership requirements. The program evolved in response to requirements and recommendations of the Army Scientific Advisory Panel (ASAP) and the Deputy Chief of Staff for Personnel (DCSPER).

The CEB is essentially a refined and reduced version of the Differential Officer Battery (DOB). Technical Research Report 1173 presented the major psychological factors derived from officer responses to tests of the experimental DOB and described the reduction of the measures obtained to a manageable number of experimental predictor scores. Dimensions derived from a factor analysis of actions observed at an Officer Evaluation Center (OEC) simulation, which was developed to test the predictive validity of the DOB, are described in Technical Research Report 1172. Research Report 1182 examined the extent to which DOB scores were associated with differential performance in the OEC exercise and success in combat and technical/administrative assignments.

The transition from the experimental DOB test battery to the operational CEB battery necessitated the collection of normative data from the relevant cadet group. These data were collected on male students in the Army Reserve Officers' Training Corps by Richard D. Doorley in 1971. The present publication uses normative data recently collected to compare male and female performances and compares these recent normative data with those collected in 1971. It carries forth the selection and assignment program responsive to the recommendations of ASAP and DCSPER as well as to the objectives of Army Project 2Q763731A768, FY 1977 Work Program.

JOSEPH ZEIDNER
Technical Director

CADET EVALUATION BATTERY: A COMPARISON OF 1975 MALE AND FEMALE SCORES WITH ONE ANOTHER AND WITH 1971 MALE SCORES

BRIEF

Requirement:

To compare male and female performance on the Cadet Evaluation Battery (CEB) and to examine changes in male CEB performance between 1971 and 1975.

Procedure:

The CEB was administered to 637 male cadets enrolled in the 2d year--Military Science (MS) II--of the Army Reserve Officers' Training Corps (ROTC) in 1971 and to 1,035 females and 926 males applying for enrollment into the 3d year (MS III) of ROTC in 1975. CEB scale and subscale scores were compared for all three samples.

Findings:

Cognitive scale scores from the 1971 sample were superior to the cognitive scores for both the male and female 1975 samples, whereas the noncognitive scores for the 1975 male group exceeded those for the 1971 group on three of four scales. The 1975 female sample achieved higher scores than the 1975 male sample on two of the three cognitive scales, but the 1975 male group was superior to the female sample on all four noncognitive scales.

Utilization of Findings:

The findings will (a) help determine the extent to which the CEB will be used for female cadets and the manner in which female CEB scores will be interpreted and (b) be used to establish new CEB norms.

CADET EVALUATION BATTERY: A COMPARISON OF 1975 MALE AND FEMALE SCORES WITH ONE ANOTHER AND WITH 1971 MALE SCORES

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CADET EVALUATION BATTERY: A COMPARISON OF 1975 MALE AND FEMALE SCORES WITH ONE ANOTHER AND WITH 1971 MALE SCORES

INTRODUCTION

The Cadet Evaluation Battery (CEB) has been used operationally as a diagnostic measure of officer potential of cadets in the Army Reserve Officers' Training Corps (ROTC) since 1972. The CEB consists of two primary parts: the Cadet Evaluation Test (CET) and the Cadet Evaluation Inventory (CEI). The CET provides a measure of the cadet's cognitive abilities in the areas of combat leadership, technical managerial leadership and career potential. The CEI provides a noncognitive measure of the cadet's interests in the same three areas as well as a measure of the cadet's career intent.

The CEB represents the culmination of a lengthy and comprehensive test development process. An early predecessor was the Differential Officer Leadership (DOL) Experimental Test Battery, which was administered experimentally to a male officer sample in 1958-1959. Based on the results of analyses on this sample, the DOL was refined to become the Differential Officer Battery (DOB) (Willemin, 1964). Factor analyses were conducted on individual tests or groupings of tests comprising the DOB (Helme, Willemin, & Day, 1971), followed by validational analyses based on an all-male sample in a simulated combat situation on the resulting scales (Helme, Willemin, & Day, 1974). The validational data were then used to select scales from four information tests, two self-description inventories (Differential Inventory-A and Differential Inventory-B), an attitudinal inventory (Individual Understanding Test), and a questionnaire on demographic and background information (Personal Data Record). Also, a new scale, based partly on items from an instrument entitled the Officer Assignment Questionnaire, was added. Items from these scales were combined to form the CEB, with the information tests providing the cognitive items and all other tests providing the noncognitive items.

The validational analyses on the DOB indicated that combat cognitive and noncognitive scales incorporated into the CEB were predictive of combat leadership performance, and that technical-managerial cognitive and noncognitive CEB scales were predictive of leadership performance in technical and managerial roles.

The career potential and career intent scales are used to predict whether the cadet will pursue an Army officer career.

OBJECTIVES

The content of CEB scales and means and standard deviations of CEB scale scores were determined on the basis of male samples. In recent years, females have been entering ROTC in increasing numbers; therefore, so that the CEB will be optimally useful for assessment and counseling of women, normative information regarding female CEB performance is needed. The present study was designed to provide such information. Also, because no standardization information on males had been collected since 1971, a new sample of males was tested for comparison with both the 1971 sample and the female sample.

METHOD

Subjects

In 1971, a sample of 637 male cadets enrolled in Military Science (MS) II from ROTC host institutions was tested.[1] These schools were representative in terms of academic level, cadet background, geographic area, and type (public, private, military).

The more recent samples comprised 1,035 female and 926 male applicants for MS III, including both advancing MS II cadets and 2-year program applicants, in FY 1975 (school year 1974-75). Units were instructed to return tests completed by all female applicants during FY 75 to ARI. Of a total of 291 units, 186 were identified as having sent tests for one or more female students. As some test information was not accompanied by an identifiable school code, the number of units contributing to this sample may have been somewhat higher. Also, among those not responding, approximately 30 schools had no females attending MS II during school year 1974-75. Many of these schools may simply have had no female applicants to MS III.

Male results were randomly selected from a complete file of all males taking the CEB in FY 1975 and also supplied to ARI.

Procedure

The CEB is a self-administered test battery developed by the Army Research Institute. This battery consists of two test booklets, 7 scales, and 23 subscales. One booklet, the CET, contains the following scales: Combat Leadership: Cognitive (CLC); Technical-Managerial Leadership: Cognitive (TMC); and Career Potential: Cognitive (CPC). The CLC scale is composed of two subscales: Tactics and Practical Skills.

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[1] This data collection effort was conducted under the direction of Richard D. Doorley.

There are also two subscales for the TMC scale: History, Politics, and Culture, and Math/Physical Science. CPC is composed of a single subscale: Technology Operations.

The composition of the five CET subscales was determined by a factor analysis of the DOB information tests (Helme, 1968a). Four of the subscales (Practical Skills; History, Politics, and Culture; Math/Physical Science; and Technology Operations) emerged as factors in this analysis, while the fifth, Tactics, was a residual content scale.

The other booklet, the CEI, contains these scales: Combat Leadership: Noncognitive (CLN); Technical-Managerial Leadership: Noncognitive (TMN); Career Potential: Noncognitive (CPN), and Career Intent. CLN contains these subscales: Nature Endurance; Combat Engineer; Combat Leader; Physical Leader; Nonaesthetic; and Organized Sports and Outdoor Skills. TMN includes these: Decisive Leader; Verbal/Social Leader; Rural versus Urban; Scientific Interest; Scientific Orientation; and Math/Physical Science Interest. CPN subscales are Administrator Noninterest; Administrative Noninterest; Combat; and Manual versus White Collar Interest. Career Intent has but one subscale, Career Intent.

Of the 18 CEI subscales, 13 were derived from separate factor analyses on each of the two self-description inventories: Differential Inventory-A (Helme, 1968b) and Differential Inventory-B (Smith, 1968). Combat Leader and Scientific Orientation were factors on the Individual Understanding Test. Rural versus Urban Interest and Math/Physical Science Interest were derived from the Personal Data Record. Finally, Career Intent was based partly on the Officer Assignment Questionnaire and partly on newly developed items.

In 1975, two forms of the CEB were in operational use. All subjects sampled that year received Form 1. The CET, Form 1, contains 100 items with 4-response alternatives. The CEI, Form 1, contains 125 items which have 2-, 3-, 4-, or 5-response alternatives. Nine CEI items are not scored.

Subjects in the 1971 sample received an experimental form of the CEB. Items scored on this form were identical to those scored on Form 1. The CEB was administered to students at the local ROTC units.

RESULTS

Standard deviations and mean scores for the 1971 sample and the 1975 male and female samples were computed for each scale (see Table 1). Results of t tests comparing group means on each scale are shown in Table 2. Male means for 1971 were significantly different ($p < .005$) from male means for 1975 for each of the seven scales. On each of the three cognitive scales, the performance of 1971 group was superior. On all noncognitive scales except Career Potential the 1975 group achieved higher scores.

Table 1

Raw Mean Scores and Standard Deviations on CEB Scales for 1971 and 1975 Samples

Scale	1971 males (n = 637) M	1971 males (n = 637) S.D.	1975 males (n = 926) M	1975 males (n = 926) S.D.	1975 females (n = 1,035) M	1975 females (n = 1,035) S.D.
Combat Leadership: Cognitive (CLC)	21.59	5.03	18.07	6.8	16.80	4.86
Technical-Managerial Leadership: Cognitive (TMC)	22.42	6.02	16.91	6.53	18.74	5.70
Career Potential: Cognitive (CPC)	10.18	3.56	7.82	4.05	8.06	2.83
Combat Leadership: Noncognitive (CLN)	23.48	6.33	25.84	5.71	19.44	6.11
Technical-Managerial Leadership: Noncognitive (TMN)	21.77	6.54	22.72	5.54	21.85	6.10
Career Potential: Noncognitive (CPN)	14.56	6.23	13.45	5.16	10.54	5.37
Career Intent (CI)	3.63	2.50	5.34	1.94	5.03	2.06

Table 2

t Test Comparisons of Sample Means

Scale	High rank (1)	Medium rank (2)	Low rank (3)	t value (1)-(2)	t value (2)-(3)	t value (1)-(3)
CLC	1971	1975M	1975F	11.14**	4.85**	24.84**
TMC	1971	1975F	1975M	12.54**	6.70**	16.90**
CPC	1971	1975F	1975M	13.45**	1.55*	11.88**
CLN	1975M	1971	1975F	7.69**	12.95**	24.15**
TMN	1975M	1975F	1971	3.48**	.25	3.09**
CPN	1971	1975M	1975F	3.84**	12.33**	13.96**
CI	1975M	1975F	1971	3.48**	12.39**	15.20**

*p < .10.
**p < .005.

Comparisons between the 1975 females and the 1971 males revealed a significant ($p < .005$) superiority for males on five of the seven scales. On one scale, Technical-Managerial: Noncognitive, no significant differences were found; on Career Intent, the female scores were significantly ($p < .005$) higher.

Scores from the 1975 male sample were significantly ($p < .005$) higher than female scores on all four noncognitive scales. Males also scored significantly ($p < .005$) higher than females on the cognitive combat leadership scale, while females scored higher ($p < .005$) on the cognitive technical-managerial scale. Females also scored higher on the cognitive career potential scale, but the difference was not significant ($.05 < p < .10$).

Means for the 1975 male and female groups were computed and compared, using t tests for each subscale, as shown in Table 3. Male and female scores differed significantly ($p < .05$) on 18 of 23 subscales; of these 18 differences, 15 favored males and 3 favored females.

DISCUSSION AND CONCLUSIONS

The most striking result that emerges from a comparison of the 1971 sample with the 1975 samples is the recent deterioration on the cognitive scales. Although some of the items used have probably become obsolete since their incorporation into the DOL in the 1950's, such obsolescence was probably almost as evident in 1971 as in 1975. An

Table 3

Raw Subscale Means, Standard Deviations, and t Values for 1975 Males and Females

Subscale (by scale)	Males (n = 926) M	Males (n = 926) S.D.	Females (n = 1,035) M	Females (n = 1,035) S.D.	t value
I. CLC					
Tactics	8.55	3.62	8.26	2.69	2.03*
Practical Skills	9.53	3.86	8.53	3.18	6.34*
II. TMC					
Hist/Pol/Culture	8.60	3.41	9.31	3.36	4.64*
Math/Phys. Sci.	8.32	3.99	9.43	3.23	6.80*
III. CPC					
Technology Op.	7.82	4.05	8.06	2.83	1.53
IV. CLN					
Nature Endurance	3.68	1.14	3.53	1.23	2.79*
Combat Engineer	4.41	2.20	2.12	2.09	23.62*
Combat Leader	2.40	1.09	2.27	1.17	2.54*
Physical Leader	3.40	1.31	3.40	1.22	--
Nonaesthetic	2.79	1.50	1.91	1.41	13.38*
Org. Sports	3.21	1.24	3.12	1.28	1.58
Outdoor Skills	5.97	2.00	3.41	2.19	26.91*
V. TMN					
Decisive Leader	6.88	2.00	6.70	2.28	1.85
Verbal/Social Ldr.	6.11	2.02	6.50	2.16	4.11*
Rural vs. Urban	3.16	1.20	3.13	1.26	.54
Sci. Interest	2.10	1.22	1.90	1.16	3.72*
Sci. Orientation	1.85	.89	1.57	.96	6.67*
Math/Phys. Sci. Interest	2.63	2.11	2.04	1.81	6.67*
VI. CPN					
Administrator Noninterest	3.47	2.00	3.01	2.09	4.96*
Administrative Noninterest	3.87	2.44	3.43	2.38	4.04*
Combat	4.08	2.19	2.35	2.14	17.67*
Manual vs. White Collar Int.	2.03	1.20	1.76	1.23	4.91*
VII. CI					
Career Intent	5.34	1.94	5.03	2.06	3.42*

[a]Percentile value of mean female score based on male norms.

*p < .05.

effort is currently in progress to replace questionable items. A more important factor may well have been the change in composition of the ROTC MS II population between 1971 and 1975. In 1971 the draft, by removing the nonmilitary job options of many college students, made ROTC a relatively attractive choice for many who might not otherwise have considered it. The competition for the limited number of ROTC spaces may well have produced a higher level of academic quality than in 1975, when the draft was no longer a factor.

It should be noted that the 1975 sample included applicants to the 2-year ROTC program as well as cadets enrolled in MS II. An exposure to ROTC courses might be expected to improve scores on the combat cognitive scale, which has a number of items on military tactics. However, such exposure would have no apparent effect on the technical-managerial cognitive scale, which is composed of history/politics/culture and math/physical sciences subtests. Because the cognitive technical-managerial scores declined to an even greater extent than the cognitive combat scores between 1971 and 1975, it does not appear that the inclusion of 2-year applicants was primarily responsible for the overall cognitive score deterioration.

Comparisons between the 1971 and 1975 male groups on the noncognitive scales revealed a trend markedly different from that found in comparisons of the cognitive scales. On each noncognitive scale except career potential, scores indicated that the 1975 group tended to have more of the interests found to correlate with successful on-the-job performance than the 1971 group. These findings are again consistent with an explanation based on the changing composition of the ROTC population between 1971 and 1975. A likely impact of the draft was to produce an ROTC population with relatively heterogeneous interests in 1971, which paralleled the interests of active military officers to a somewhat limited degree. With the draft eliminated by 1975, students with traditional military interests were more prevalent in the ROTC population. This explanation is consistent with the finding that the 1975 group demonstrated more motivation for a military career than the 1971 group on the career intent scale.

Comparisons between male and female scores from the 1975 samples indicated that females tended to perform as competently as males on the cognitive scales but did not perform as well on the noncognitive scales.

Although the reliance on voluntary cooperation of schools in obtaining data on females raised the possibility of response bias, a sufficiently large proportion of schools did respond to indicate that the female sample mean obtained here was a fairly reasonable estimate of the population mean for female applicants to the ROTC Advanced Course in 1975.

Any interpretation of the results for females must recognize that efforts to select and validate CEB items were conducted using male samples. Thus the noncognitive items selected indicated what interests and preferences are characteristic of a successful male officer, but these may not correspond exactly to the interests and preferences of a successful female officer. It cannot, then, be concluded that the noncognitive scores show that male ROTC students are more likely to be successful officers than female ROTC students.

Research is currently in progress to validate the CEB on females, using the 1975 sample. Until the results of this investigation are available, interpretations of female noncognitive scores must be made with special caution. The results on the cognitive scales provide at least a preliminary indication that the operational use of these scales does not place female cadets at an unfair disadvantage.

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